## Input equipment: Keyboard training

*Moderator:* E. R. Lannon

**Keyboarding skills:** L. M. H. J. van Geffen

*Mr Airey:* The concept of improving keyboard skills is very interesting. How large is the sample; and on how many people has this been tried?

*Mr van Geffen:* I gave a review of keyboarding skills by a review of the literature and the results of experimental psychology. These are not the certain results of experiments. I have just reviewed relevant experiments in psychology and have applied the results to the skill of keyboarding. This approach may give some understanding. It is not based on studies undertaken by myself, but on the studies done by other people.

*Dr Margerison:* There is a problem in doing any worth-while experiments in this field in the printing industry, because one has a responsibility to the men who are going to operate the keyboards. We cannot really afford, however nice it would be, to train people on a particular type of keyboard merely in the hope that the results will be better than with a conventional one. Thereafter one has a group of people who have been trained on something that is not interchangeable. Has anyone given any thought to the question of how we can progress? My own view of the work of the experimental psychologists, interesting though it may be, is that their experiments are not typical of typographic keyboarding, and cannot be typical as their samples are far too small.

*Mr van Geffen:* It is very dangerous indeed just to give a new keyboard to operators, and I do not think anyone would advise this. But it is worth-while to give some thought to what factors are involved: what the keyboards really are; and what are the problems when one is going to train people. When one is trying to decide on a new keyboard, Dr Margerison's point is really made when he says that the research of experimental psychologists is not done on keyboarding itself, and not done on a wide enough sample. I agree with him, but that does not mean there is no research into skill. I think it is important to rely on what is learned in skills in finding out what are the essential components of skills. The essential purpose, which I wanted to reproduce in this paper, was that one can rely on a great deal of knowledge in psychology on general research that is done. Then one has to do some specific experiments to keyboarding to test out this hypothesis.

*Mr Kodis:* Development work is not in the field unless one wants to take risks with one's customers or superiors. There are people working in laboratories who do experiments, take people in and train them. These are not people making their livelihood in a printing plant. We have done some of this in our organization; Dr Levy did this quite extensively for the Canadian Post Office, where he had the encoding problem of reading the addresses on mail and putting them in a machineable form. He developed a special keyboard, using the stenotype technique; the speeds he achieved were not believable until one stood there for an hour and watched the operators work. Such work has to be done in a laboratory until one is ready to risk it outside.

*Dr Margerison:* There has been a great deal of work done on various keyboards, and people like Kroemer, or Dvorak before the war, will claim great improvements in productivity for keyboards, but the problem that none of us has solved is unless we can go one step beyond the laboratory and think of some way which would require trade union co-operation and goodness knows what else to get an experiment carried out on a larger scale, I do not think we can really carry it very much further.

*The Moderator:* It is true, particularly with respect to Dvorak's work. We came close in the United States Government to adopting the Dvorak keyboard, but there was entrenched opposition to it by all the typists in the Government.

*Dr Leonard:* I think the position is quite simple; the ethics of this were solved by the Treasury in the Dvorak study in this country. That is, you guarantee to every operator trained by a new method that he or she will continue to be able to use that method while he or she remains in Government employment.' That was done with the Dvorak study by the Treasury.

*The Moderator:* How many Dvorak keyboards did they have in the Treasury?

*Dr Leonard:* They did a study on the Dvorak keyboard, and the other day I received a letter from the person who considers himself to be the last Dvorak keyboard operator in the United Kingdom, but his typewriter still has a Dvorak keyboard. When we get to the stage where we have got a hunch sufficiently strong from our laboratory work that we can put it into the field, we must try to persuade management, or whoever is responsible, to ensure some form of continuity for the people trained in this way.

**The effect of varying statistical structure of the input on typing & reading speeds:** J. A. Leonard

*Mr Skitteral:* On the question of learning letter-by-letter, are you not going against the normal short cuts the brain takes in

reading a word and automatically assimilating it through to the fingers on to the keys? In reading a number of words, one actually assimilates or assumes what word is coming.

*Dr Leonard:* That is the issue. Are we going against the short cuts and if we are going against the natural short cuts, is the natural short cut such a good thing when we are dealing with an unnatural task like typesetting? It is not a natural motion to sit before something with many keys and be expected to find the right one at the right moment. The natural mode of operation is quite clearly to look at that thing and read it out and put it into a speech-recognizing aspect.

*Dr Margerison:* There is a question I would like to ask about this training of people on the letter-by-letter method which I am afraid I think is wrong in principle. It goes against the normal method of assimilation of information. One never reads letter-by-letter.

*Dr Leonard:* You may not read letter-by-letter. But it may be very much more efficient to translate letter-by-letter when you have to break up the word into letters.

*Dr Margerison:* If we are going to teach people to read all over again, then I think I would agree. But in fact we have people who are partly trained in the process. It seems to be a retrograde step to make them read letter-by-letter, to which they are not accustomed, and which eventually they will not do, in order to teach them a particular fingering of the typewriter. Do we know whether there is any difficulty in moving people across from the one approach of letter-by-letter training to the subsequent approach of recognizing outlines and motions of fingers?

*Dr Leonard:* We do not know everything in this field. I am quite seriously agreeing with your first remark, in the very real sense, we know nothing about typing skills, about the mechanics of typing skill, about reading, translation and the whole process.

*Dr Margerison:* These typists are really only part-time keyboard operators, if and when they get out into the big world. Any newspaper composing room supervisor would be able to tell you that when it comes to getting the results of work earnings, it takes a lot longer than a great deal of other material.

*Dr Leonard:* If any newspaper office will offer me facilities to test over an extended period of time—that is to say, to give half-hour tests over two years every fortnight to their operators on prepared material, then I can assure you I can persuade the Medical Research Council to let me do it.

**A new typewriter training system:** C. P. Gane & B. N. Lewis (read by P. Woolfenden)

*Mr Dixey:* What kind of keyboarding speeds achieved in how much time will satisfy you that your machine is worthy to be put on the market?

*Mr Woolfenden:* I think if we get up to a speed of forty words a minute in twenty hours' instruction on the machine, that will be a satisfactory start.

*Mr Dixey:* For a further period of training, or for higher speeds, you would send people for further training or on-job training?

*Mr Woolfenden:* It could be continued if we produced a better system of pacing, and had a better typewriter in the machine.

We are looking into this with one of the Olivetti machines, which produces a much faster response. I think it could be continued to much higher levels of speed, but we have not yet reached that stage.

*The Moderator:* I was going to comment that forty words a minute is not bad. We did some tests in our department by putting psychometers on typewriters to measure the actual yield we got from girls who were full-time typists, and we did not get anything like 40 words per minute. These were actual typists doing eight hours a day, and we were applying a policy that Metropolitan Life Insurance Company produced in studies in 1939 on manual keyboards, 83 strokes per minute was the standard. Applying this standard to actual machines in our field, we came up with the equivalent of two hours of typing per average typist, who theoretically was working at eight hours a day typing. I think you will find, for example, in the Federal Service in the United States the acceptance level is 45 words per minute by a typist, but in actual production one does not get anything like it. Therefore, if one could get a girl up to 40 words per minute, it would be very good.

*Mr Dixey:* It just depends. If you keep somebody supplied with work and the machine is all right, there is no reason why you should not expect very high speeds.

*The Moderator:* You just do not get them. How many people actually measure the output of their typists really to see what they get?

*Dr Leonard:* On a point of information, does anybody here know what is the average speed on which typing offices cost their product?

*The Moderator:* Metropolitan Life was using 83 strokes per minute. That was what they paid on. The girl who actually achieved that was paid at 100 per cent; and above that speed in one per cent increments to salary.

**Training methods for keyboard operators & Aptitude tests for computer teletypesetting operators:** Lillian G. Malt

*The Moderator:* In measuring these systems relating to output, were the standards the same?

*Mrs Malt:* Yes, they were. One of the problems one has with the initial method training is that very often they have such an increase in output that one has to do something quite drastic about the levels of payment.

*Mr Dixey:* How intense is your training, and when you are training people, is training their sole occupation?

*Mrs Malt:* When we are training people, training is their sole occupation, except where we are retraining to higher speeds, where we would take people for half days. If we are taking people and training them on the same keyboards, for instance, if we are retraining anybody who is using a typewriter style layout to a higher speed on a typewriter style layout, then we take them for half days, for two-and-a-half to three hours; then they operate machines normally for the rest of the day. Where we are retraining on to different machines—and we may be wrong in this—we feel that they should be wholly occupied with the retraining on to new machines, because of the breaking of the old habit patterns.

*Mr Dixey:* And do you train the whole day? When you retrain to the different keyboard, do you keep them at it day after day?

*Mrs Malt:* When we are retraining on a new keyboard, we would do up to four hours in the day.

*Mr Butler:* In the example Mrs Malt has given, the average of a group of people in work operating was a speed of 6,600 and the top speed attained was 20,480. Could she tell me under what conditions the tests were performed; whether that in fact is the average output over the eight-hour day?

*Mrs Malt:* These were test conditions, and the longest was a galley run time of 45 minutes.

*Mr Butler:* What would you expect a man to maintain in output over the average working day?

*Mrs Malt:* We find if they are operating at an average of 40 words per minute in printing terms—that is, six strokes to the word—then they lose about half when they go on to production. If their speed is over sixty words a minute, which is in typing terms over seventy, then we find that the loss is not more than a third, assuming unjustified setting.

*Dr Leonard:* I am a little surprised at the claim at the end of Mrs Malt's paper of 30,000 to 36,000 keystrokes, because that implies that one is operating on an average at the maximum tapping rate with non-perceptual load, unless my arithmetic is wrong. That takes us to somewhere about ten strokes a second, and ten strokes a second is a maximum free tapping rate maintained over half a minute.

*Mrs Malt:* That may be a maximum tapping rate, but the highest speed that we have recorded is 216 words per minute. This was a test in America. I suggest Dr Leonard tells us what that one works out at. The world record—at the last typing championships, which I have got from the *Guinness Book of Records,* held in 1946—on standard machines is 170 words a minute. I do not know what standard tapping rate that would be.

*Dr Leonard:* These speeds refer to championship speeds which are comparable to your other example of four minute miles that you quote in the other paper. We are talking here not about champions, but about the average performance of average groups of operators. To take as your target or as your baseline for comparison exceptional performances by people who spend all their lives training for a particular skill in an ordinary training situation does not seem to me as a mere experimentalist to be realistic.

*Mrs Malt:* When we talk about average speeds of average operators, we are looking at average speeds of average operators in the past who have been trained by average methods. I should say that we should be able to lift the average speed of the average operator, and this is what we are trying to do. When I quote 30,000 to 36,000 keystrokes per hour, I personally have not trained anybody yet to 36,000 keystrokes an hour, but I have trained quite a number to 30,000 keystrokes per hour.

*Mr Jolliffe:* You refer to a breakdown of the learning process into meaningful assimilable wholes. Does this refer also to the sort of text matter which you expect your keyboard operator to be dealing with? My preoccupation is with a multi-language set of data, and not merely multi-language within the roman alphabet, but the possibility of switching from the roman alphabet to Cyrillic or to Hebrew and back to roman, in which case none of the professional staff at the British Museum could possibly cope with this, in that none of us could understand all the matter which is coming up, but we do expect or hope that some keyboard operator will get the right key to whatever happens to come on copy.

*Mrs Malt:* What you want there are very good letter-for-letter operators. You want very good 'trotters'.

*Dr Leonard:* Perhaps I could remind you all of the remarkable improvement in typing achieved in the RAF at the end of the war, after the typists had been given a course in spelling.

*Mr H. O. Smith:* Do you have a standard of cleanliness as a result of your training? I note that in works A you reduced errors from 4.8 per 100 words, which is tremendously high, to 1.9 which is a fraction over two mistakes per thousand key taps. This is a very low standard in the printing industry. Must they reach a minimum number of mistakes per thousand key taps?

*Mrs Malt:* We count errors rather differently from other people. We count every error made, whether corrected or not, so that our 1.9 is every error that has been made, whether corrected or not. We find in the printing world on the whole that if they have corrected the error it is not counted, but we count every error made because it takes time to correct it.

In actual performance on machines on copy, the error rate does go down a lot. I can give you that for operators on actual output, not on speed tests. Again this is uncorrected: .6611, .8, .9, .6, .7, .6, .5, .8, .4, .6, .3, .0. These figures apply to one man; those are the total errors made, and this was taken on actual work done.

*Mr H. O. Smith:* With regard to output in justified lines compared

to output in so-called idiot tape, there is a great deal of controversy over this increase in output when you do not have to justify. In America the claims range from about 25 per cent to 60 per cent. I wonder if in your experience you have any private views on the increase in output?

*Mrs Malt:* There are so many other variables that we find affect the output and I have not had enough cases to study.

*Mr Butler:* On a work-measured basis we have been able to make some comparisons between similar texts, justified and unjustified set, and we have found an increase of about 27 per cent.

*Dr Leonard:* On what correlation are the aptitude test results based?

*Mrs Malt:* On the passing of the three aptitude tests, together with passing a speed accuracy typing test. It is a two-by-two correlation (a two-by-two table, pass fail, pass fail).

*Mr Fairey:* Is there any way of testing people's incentive, desire to get on and willingness to work? Some with less aptitude show more willingness to work than those with aptitude.

*Mrs Malt:* There is a decided question of motivation, because in a number of firms one finds a fairly average level. In one firm everybody is operating, say, between 50 and 55. In another, everyone is operating at well over 60, nobody under 60. In the firm where we found the girl operating at 86, there were a number operating at over 80.

*Mr Arens:* Does Mrs Malt feel that this has any application to photo typesetting keyboards, such as Photon-Lumitype? In the National Geographical Society we have had these machines for 18 years and we have never used any person with previous training. We just get people in, whether they can typeset or not, and we use them and train them. In about four or five weeks they typeset all the material, and in the 18 years we have only had one failure. We also had good results with people with no training of any sort.

*Mr Kodis:* There are many subsidiary keys and controls. Typing is not the whole job, although it is a major element. There is a good deal of moving of the hands to the left and to the right, and up and down in some of these machines, so it is more than just typing.

*Mrs Malt:* It would be interesting to note what results Mr Arens would get with people who are trained.

*Mr Arens:* We may not want to. We are satisfied with how it is.